CHAUCER'S PORTRAIT GALLERY.

THE HABERDASHER, ETC.

In this group of portraits Chaucer has not attempted to give us any individuality; no doubt, none knew better than himself that in describing one of these "warm comfortable men," he described all; whilst by "massing them," he brought out still more strongly the chief and common feature—their wealth.

"An haberdasher and a carpenter,
A webbe*, a dyer, and a tapiser†,
Were all yclothed in one livery
Of a solemn and great fraternity.
Full fresh and new their gear ypiked‡ was.
Their knives were ychaped§ not with brass,
But all with silver wrought full clean and well:
Their girdles and their pouches every del‖.
Well seemed each of them a fair burgéss
To sitten in a guildhalle on the dais;
Everich for the wisdom that he can
Was shapelich for to be an alderman.
For catthe hadden they enough and rent;
And eke their wivés would it well assent:
And elles certainly they were to blame.
It is full fair to be yeleped Madame,
And for to go to vigils¶ all before,
And have a mantle royally ybore."

The best illustrations of this passage of the prologue will perhaps be a few notices of the trades and companies to which these civic pilgrims belonged, and of the aldermanic rank to which they, and more particularly their wives, aspired.

The haberdashers were perhaps the principal of the trade associations with which we have here to do. They were originally a branch of the mercers, and dealt, like them, in small wares. Lydgate, in his well-known ballad of 'Lykpenny's Adventures in London,' places their stalls in the 'Mercery,' at Cheap. About the time of Chaucer they divided into two fraternities, dedicated respectively to St. Catherine and St. Nicholas; one branch consisting of the hatters or hurrers, and the other of the dealers in miscellaneous articles, who were also called milliners, from their importing Milan goods for sale, such as broaches, aiglets, spurs, glasses, &c. Pins formed an important article of the haberdashery trade at this period, having not long superseded the points or skewers made of thorns, by which ladies were previously obliged to fasten their garments. With respect to the carpenters of the fourteenth century, we have only to mention that the tools of an individual engaged in that trade in Colchester consisted merely of a broad axe, value five pence, another three pence; an adze, two pence; a square, one penny, a navegor (probably a spokeshave), one penny: making the total value of his implements one shilling A carpenter of the present day would be puzzled to perform all the variety of operations required of him with such tools only: *his* chest is a somewhat expensive affair. The weavers' guild was one of the oldest associations of the kind of which we have any account;

* Weaver. † Maker of tapestry. ‡ Picked; spruce. § Furnished; mounted. ‖ *Every del*, every part, or every bit. ¶ The eves of festivals.

and we possess a record in connection with them which is interesting in several points of view. We allude to the particulars of a case brought before the Justices Itinerant sitting at the Tower of London, in the reign of Edward II. On this occasion "the weavers were required to show by what authority they at this time claimed to have their guild in the city, and by virtue of the same guild to have yearly the right of electing from amongst themselves bailiffs and ministers; and the same so elected to take and swear in faithfully to execute their offices before the mayor of London? By what right also they claimed to hold their courts from week to week of all that pertained to their guild, and that none should intermeddle with their ministers in London, Southwark, or the parts adjacent, unless by their own permission, or that it were done by one of the guild; and that persons of the same guild should not be impleaded by others of matters concerning the mystery, except in the courts of the guild, or be elsewhere accused and answered? Why none might have working implements in their possession unless the same were testified to be good and honest, and that all of the mystery should be forced to contribute to the king's ferme? Why no stranger was to be admitted as a manufacturer amongst them without producing letters testimonial of good conduct, and the reasons of his coming? Why the working implements of such of the mystery as were in arrears of their fermes might be distrained by the bailiffs of the guild? . . . . It was further demanded, why, if any one manufactured *cloth of Candlewick Street*, he ought to be overlooked by the bailiffs of the guild, whether or not his work was bad, and to the damage of the people; and if so, that it should be proved before the mayor of London, and the offender fined in half a mark; and moreover that such workmen should be brought before the bailiffs of the guild, according to the Constitutions; and whatever cloth or piece of cloth should be found to be of Spanish mixed with English wool, contrary to proper usage, might be adjudged to be burnt? . . . . Why those of the guild might sell without control in London all things belonging to the mystery? And, lastly, why none were allowed to work between Christmas and the Purification, or at night by candlelight, at other times proscribed?"* The weavers pleaded in answer a charter of Edward I., in which were recited charters of Henry II. and Henry I.; but the jury decided in a great measure against them with regard to the privileges claimed, and declared that the business was managed by the weavers "to their own profit and the common hurt of the people." Of the Dyers' Company, we need only remark that it possessed the peculiar privilege of keeping swans on the Thames. Some idea of the respective footing of these Companies in Chaucer's time is afforded by a paper in the City Records, showing the number of persons sent by each to the Common Council. The Haberdashers and Hurrers, the Weavers, and the Tapisers, or Tapestry-makers, sent four from each Company; the Joiners, or, we presume, Carpenters, two; whilst the Dyers' Company was not at all mentioned.

It appears from the text that aldermen's wives were honoured with the title of Madame, and that they took precedence in attending vigils, and of course on other public occasions. The qualifications required from persons elected as aldermen were, a certain number of cattle and a certain amount of rent. According to Stow, it was necessary also that the person proposed for alderman should be without deformity in body, wise and discreet in mind, wealthy, honourable, faithful, free, and of no base or servile condition; that no disgrace which might happen to him on account of his birth, might thence redound on the rest of the aldermen or the whole city. And hence it came to pass that none was made apprentice, or at least admitted into the liberty of the city, unless he was known to be of a gentleman-like condition; or if, after he had been made free, it came "to be shown that he was of servile condition, for that very thing he lost the freedom of the city."*

About the period Chaucer is supposed to have been writing the 'Canterbury Tales' (1386), it was ordered that in the taking of apprentices, and also in the admitting to freedom, that ancient custom should be observed thenceforward. There seems indeed every reason to suppose that the title and person of an alderman were as yet looked upon with high respect, and that its old baronial dignity was far from being forgotten.

About 1350, Stow says the ancient and honourable custom with regard to the burial of aldermen was still observed; and he gives a case in point:—"In the church where an alderman was to be buried, one armed with his arms, bearing in his hand a standard on an horse with trappings, carried aloft his shield, helmet, and his other arms with the standard, as the manner yet is of burying the lord barons."

* Herbert's 'History of the Twelve Great Livery Companies,' vol. i., p. 18.

* 'Survey of London,' b. 5.

PAINTING IN FRESCO.

THERE is a kind of painting which is very little known in England, but which, in foreign countries, has been made the vehicle of some of the noblest of pictures,—we mean *fresco*. This word does not very well express the nature of the process, since it is merely an Italian term equivalent to our word for *fresh;* but it seems to have been applied on account of the colours, in this mode of painting, being laid on damp *fresh* plaster.

Painting in oil was not, as far as we at present know, executed until about the thirteenth century; and therefore all the pictures painted before that time were in fresco, distemper, enamel, encaustic, &c. Many ancient paintings, in Egypt, in Herculaneum, in Pompeii, and other places, executed many centuries ago, and only brought to light in modern times, are in fresco, and exhibit colours of extraordinary brightness. During the dark period which intervened between the time of the Romans and the revival of the fine arts in Italy in the fourteenth century, fresco-painting shared the lot to which all the other branches of art were doomed, and was forgotten; but Raffaelle, Michael Angelo, and other great painters, not only revived the art, but brought it to a pitch of perfection which excelled anything previously, or indeed subsequently, achieved. It was a kind of painting so congenial to the vast mind of Michael Angelo, that he deemed it the only one worthy of a great artist, painting in oil being "only fit for women and children."

This opinion as to the pre-eminence of fresco over oil-painting arose in great measure from the difficulties which surround the former, and which can only be surmounted by a man of great talent. It is the peculiar and distinguishing feature of this kind of painting, that the colours must be laid in while the plaster is wet, or at least damp, in order that they may dry with the plaster, and in so doing combine firmly with it; and as the plaster dries in the course of a few hours, the production of a large picture becomes a sort of patchwork, each day's painting being distinct and detached from the rest, and executed in a portion of plaster which has been laid on the same day. The difficulties which thence result have been thus alluded to by a writer on the subject:—"There is no beginning in this by drawing in the whole of the parts at one time and correcting them at leisure, as is the custom of oil-

painters, who may therefore proceed to work without a sketch. Here, all that is begun in the morning must be completed by the evening, and that almost without cessation of labour, while the plaster is wet; and not only completed in form, but a difficult task, nay, almost impossible without a well prepared sketch, must be performed, viz. the part done in this short time must have so perfect an accordance with what follows or has preceded of the work, that when the whole is finished it may appear as if it had been executed at once or in the usual mode, with sufficient time to harmonise the various forms and tones of colour. Instead of proceeding by slow degrees to illuminate the objects and increase the vividness of the colours, in a manner somewhat similar to the progress of nature in the rising day, till at last it shines with all its intended effect, which is the course of painting in oil; the artist working in fresco must at once rush into broad daylight, at once give all the force in light and shade and colour which the nature of his subject requires; and this without the assistance, at least in the commencement, of contrast to regulate his eye."

Fresco-paintings are usually executed on the walls of buildings, such as churches, galleries, corridors, saloons, &c.; and the routine of proceeding is somewhat as follows:—The artist first prepares a sketch, embodying the subject which he wishes to represent. He next draws the outline of the design on a *cartoon*, or piece of paper, exactly the size of the intended fresco. The word cartoon, which has almost a magic effect in connection with the fine arts, is literally nothing more than a modification of *cartone*, the Italian name for a large sheet of paper. (The cartoons of Raffaelle, described in our Supplement for September, are similarly sheets of paper, the designs on which were to serve as originals from which tapestries were to be copied.)

While the sketch and the cartoon are in course of preparation, the wall on which the labours of the painter are to be directed is also being prepared. One indispensable requisite is, that the wall should be free from damp, for fresco-paintings, from the nature both of the colours and of the plaster in which they are laid, are very susceptible of injury from damp; indeed, one reason assigned for the non-prosecution of this art in England is the dampness of the climate. When the fitness of the foundation is ascertained, a preparatory layer of plaster is laid on, which varies according to the material of which the wall is composed. Brick is deemed the best foundation, because, from the smallness of the size of the bricks, the interstices between them are numerous, which greatly assists in retaining the plaster in adherence. If the wall consist of smooth stones, it is customary to chisel holes or grooves in it, or adopt other means whereby the plaster may be made to cling to the foundation on which it is laid. Precautions of this kind are very necessary to prevent the cracking of the composition. This preparatory plaster consists sometimes of well-washed chalk made into a cement with pounded brick or river-sand; some painters have used pounded sea-sand and chalk or lime; while others have employed somewhat analogous materials, varied in minor details.

When the preparatory layer of plaster is dry, the second or finishing layer is applied, the surface of the first layer being slightly wetted to aid the adhesion of the two. The materials are nearly the same as for the first layer, but more carefully prepared; and the art of laying it on is one of great nicety, for it must be free from lumps, spread evenly and smoothly, and laid on in no greater quantity, or over no greater an extent of surface, than the artist can colour before the plaster dries, which it does in from five to eight hours, according to the season. The plaster is laid on with a trowel, and is afterwards smoothed over with the same instrument, a piece of paper being laid between the trowel and the paper.

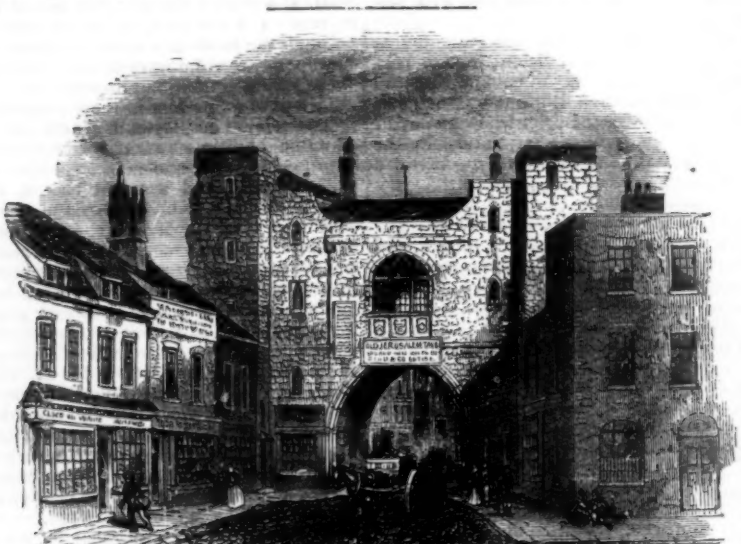
When the plaster is sufficiently firm to bear the pressure of the finger, but still damp enough to allow the colours to incorporate with it, the painter commences his labours. He places his cartoon against the wall, and traces the outlines of the figures or other objects on the design, either by pricking with a pin through the paper at numerous points, or by passing a hard point over the lines of the cartoon. By either of these means a faint impression is made in the plaster, sufficient to guide him in the application of his colours.

The colours employed in fresco-painting are wholly of mineral origin, no animal or vegetable colours being admitted. Chalk and marble-powder for white; vermilion, burnt and unburnt ochres, burnt and raw sienna, Spanish red, &c., for red and brown; ultramarine and smalt for blue,—are among the colours employed; while greens, yellows, blacks, &c. are produced from analogous earthy or crystalline bodies. The colours are ground very fine, and mixed with water, and arranged on a pallet or in small vessels, as for other kinds of painting. Prepared water-colours used on paper or ivory, and oil-colours used on prepared canvas, present nearly the same tint when dry as when wet; but in fresco and in distemper painting this is not the case, since all the colours become much lighter when dry than when wet. To be certain, therefore, of the resultant hue, the painter usually has a piece of some absorbent earthy substance, such as tile or brick, at hand, on which he can try the tint yielded by any combination of his colours.

The artist proceeds to work out his design with the colours just alluded to, and on the foundation of damp plaster; but here the genius of the painter is called into action, and technical description fails of conveying an adequate idea of his labours. The excellence and defects of fresco-painting have been thus stated by a writer familiar with the subject: As the artist is obliged, from the nature of this kind of painting, to proceed with rapidity in its execution, it has necessarily more spirit and vigour than paintings in oil, which may be repeated and re-touched as often as the artist fancies he can improve or heighten their effect; there is not time to meddle with and disturb the freshness of the colour, or the fullness and freedom of the touch. But, on the other hand, there can be no minute detail of forms, or extensive variety in the gradation of tints; the beauties of neatness and delicacy of finish make no part of the excellencies of this branch of art; it will not bear the close examination which well-finished pictures in oil do; and there is something dry and rough in its appearance, when inspected from too short a distance. Though the colours have more freshness of hue than those used in oil-painting, yet, as their number is comparatively smaller, their united power of imitating nature is not so complete.

To enumerate all the eminent specimens of fresco, ancient and modern, would require a volume. We can therefore only mention, that after a temporary cessation of the art for some time, it has been lately revived with extraordinary effect in Bavaria, where the enlightened king is enriching his capital, Munich, with almost innumerable specimens of this branch of art. In our Nos. 270 and 271 will be found descriptions of two new galleries at Munich, one for pictures and the other for sculptures; and both of these galleries, as well as two new palaces belonging to the king, a chapel-royal, an arcade, and other buildings, have been decorated with magnificent series of frescoes, mostly embodying some historical or allegorical subjects. Of these frescoes we have given specimens in Nos. 292, 294, 295, and 297, together with an account of

the historical poem from which they are taken. Whether we shall ever see a school of fresco-painting in England, depends principally, we imagine, on the kind of patronage bestowed upon the art. Unless the walls of large buildings are decorated with frescoes, this branch of art is not likely to flourish. We may hope for the best, as in a recently published Report of the Parliamentary Committee on the Fine Arts in connection with the New Houses of Parliament, the opinions of many of our principal artists, especially Mr. Eastlake, are given on the expediency of decorating the interior of those buildings with frescoes. Although the difficulties are not lost sight off, yet the general impression seems to be in favour of such a plan.



[St. John's Gate, Clerkenwell, 1841.]

ST. JOHN'S GATE.

A RECENT number of the periodical work entitled 'London' contains an article on St. John's Gate; the greater part of which is devoted to an account of the priory of St. John of Jerusalem, at Clerkenwell, in connection with the history of the Knights of St. John, subsequently the Knights of Rhodes and the Knights of Malta; which history has been fully given in the 'Penny Magazine.' There has been some talk of reviving the institution, with a Prince of the Blood as "the Prior" in England. It will be perceived that such *playing at chivalry* is not original; and that the very ground which these knights of old occupied is already the scene of a very respectable travestie of the heroic ages.

When Samuel Johnson first saw St. John's Gate, he "beheld it with reverence," as he subsequently told his amusing biographer Boswell. But Boswell gives his own interpretation of the cause of this reverence. St. John's Gate, he says, was the place where the 'Gentleman's Magazine' was originally printed: and he adds, "I suppose, indeed, that every young author has had the same kind of feeling for the magazine or periodical publication which has first entertained him." He continues, with happy naïveté, "I myself recollect such impressions from the 'Scot's Magazine.'" Mr. Croker, in his valuable notes to Boswell's 'Johnson,' has a very rational doubt of the correctness of this explanation: "If, as Mr. Boswell supposes, Johnson looked at St. John's Gate as the printing-office of Cave, surely a less emphatical term than *reverence* would have been more just. The 'Gentleman's Magazine' had been, at this time, but six years before the public, and its contents were, until Johnson himself contributed to improve it, entitled to anything rather than *reverence;* but it is more probable that Johnson's *reverence* was excited by the recollections connected with the ancient gate itself, the last relic of the once extensive and magnificent priory of the heroic knights of the order of St. John of Jerusalem, suppressed at the dissolution, and destroyed by successive dilapidations."

A century is passed away since Johnson, from whatever motive, beheld with reverence the old gate of the hospital of St. John of Jerusalem. There it still remains, in a quarter of the town little visited, with scarcely another relic of antiquity immediately about it. Extensive improvements are going forward in its neighbourhood; and it may probably be one day swept away with as ruthless a hand as that of the Protector Somerset, who blew up the stately buildings of the hospital to procure materials for his own palace in the Strand. May it be preserved from the most complete of all destroyers—the building speculator! It has to us a double interest. It is the representative of the days of chivalrous enthusiasm on the one hand, and of popular improvement on the other. The Order, which dates from the days of Godfrey of Bouillon, has perished, even in our own time—an anomaly in the age up to which it had survived. The general desire for knowledge, which gave birth to the 'Gentleman's Magazine,' is an increasing power, and one which depends upon no splendid endowments and no stately mansions for its maintenance and ornament. Cave, the printer, was the accidental successor of the Prior of the Hospital of St. John. But, representing the freedom of public opinion, he was the natural successor of the despotic power of a secret society. At any rate, the accident invests St. John's Gate with an interest which would

not otherwise belong to it; and in its double character we may not be ashamed to behold it "with reverence." Before we carry ourselves and our readers into the past, we must, however, request their companionship while we examine what St. John's Gate now is. At the head of this paper they have a representation of its present external appearance: but a peep into the interior may furnish some amusing contrasts with the days of the Edwards and Henries.

Turning out of St. John's Street to enter St. John's Lane—a narrow street which runs obliquely from that wide thoroughfare—the Gate presents itself to our view, completely closing the road, and leaving a passage into St. John's Square only through the archway. The large masses of stone of which the Gate is composed are much decayed; but the groined arch has recently been restored. This restoration, which appears to have proceeded from a desire to preserve this monument as public property, seems out of character with the purposes to which the Gateway is devoted. A huge board which surmounts the archway informs us that we may here solace ourselves with the hospitalities of the Jerusalem Tavern; and, that we may understand that the entertainment which may be set before us will not be subjected to any of the original notions of abstinence which a pilgrim might once have been expected to bring within these walls, a window of a house or bulk, on the eastern side of the Gateway, displays all the attractions of bottles with golden labels of "Cordial Gin," "Pineapple Rum," and "Real Cognac." We pass under the arch, and perceive that the modern *hospitium* runs through the eastern side of the Gateway, and connects with premises at either end. We are here invited "To the Parlour;" and we enter. A comfortable room is that parlour, with its tables checkered with many a liquor-stain; and genius has here its due honours, for Dr. Johnson's favourite seat is carefully pointed out. But the tavern has higher attractions than its parlour-fireside with Dr. Johnson's corner; it has a "Grand Hall," where the "Knights of Jerusalem" still assemble in solemn conclave every Monday evening. It was long before we ventured to ask whether any uninitiated eyes might see that Grand Hall; but we did take courage, and most obligingly were we conducted to it. We ascended the eastern turret by a broad staircase (but certainly not one of the date of the original building), and we were soon in the central room of the Gateway. It is a fine lofty room, and, if there be few remains of ancient magnificence—no elaborate carvings, no quaint inscriptions, no "storied windows,"—the spirit of the past has been evoked from the ruins of the great military order, to confer dignities and splendours on the peaceful burghers who are now wont here to congregate. Banners, gaudy with gold and vermilion, float upon the walls; and, if the actual "armoury of the invincible knights" be wanting, there are two or three cuirasses which look as grim and awful as any

> "Bruised arms hung up for monuments."

Nor are the fine arts absent from the decoration of this apartment. Sculpture has here given us a coloured effigy of some redoubted Hospitaller; and Painting has lovingly united under the same ceiling the stern countenance of Prior Dockwra, the builder of the Gate, and the sleek and benign likenesses of the worshipful founders of the modern Order. Their names may one day have a European fame, like those of Fulk de Villaret and Pierre d'Aubusson; but in the meanwhile history records not their exploits, and we shall be silent as to their names. They are quiet lawgivers, and not rampaging warriors. They have done the wise thing which poetry abhors—changed "swords for ledgers." Instead of secret oaths and terrible mysteries, they invite all men to enter their community at the small price of twopence each night. Instead of vain covenants to drink nothing but water, and rejoice in a crust of mouldy bread, the visitor may call for anything for which he has the means of payment, even to the delicacies of kidneys, tripe, and Welsh rabbits. The edicts of this happy brotherhood are inscribed in letters of gold for all men to read; and the virtuous regard which they display for the morals of their community presents a striking contrast to the reputed excesses of the military Orders. The code has only four articles, and one of them is especially directed against the singing of improper songs. Here then is mirth without licentiousness, ambition without violence, power without oppression. When the Grand-Master ascends the throne which is here erected as the best eminence to which a Knight of Jerusalem may now aspire, wearing his robes of state, and surrounded by his great commanders, also in their "weeds of peace," no clangour of trumpets rends the air; but the mahogany tables are drummed upon by a hundred ungauntleted hands, and a gentle cloud of incense arises from the pipes which send forth their perfume from every mouth. Would we had partaken of that inspiration! After the third hour the dimensions of the "Grand Hall" of the Jerusalem Tavern would have expanded into the form and proportions of the "Great Hall" of the Priory of St. John. The smoke-coloured ceiling would have lifted itself up into a groined roof, glorious with the heraldry of many a Crusader or Knight of Rhodes. The drowsy echoes of "tol de rol" or "derry down" would have melted into solemn strains of impassioned devotion: and the story three times told, how Jenkins beat his wife and was taken to the police-station, would have slided into a soft tale of a Troubadour discovering his lady-love who had followed him through Palestine as a pretty page. Slowly, but surely, the green coats and the blue, the butcher's frock and the grocer's apron, would have become shadowed into as many black robes; and in the very height of our ecstacy the white cross would have grown on every man's breast out of its symbolical red field. Then the "order, order" of the chairman would have become a battle-cry; the knock of his hammer would have been the sound of the distant culverin; the hiccups of the far-gone sipper of treble-X ale would have represented the groans of the wounded. We should have fallen asleep, and have dreamt a much more vivid picture of the ancient glories of the Priory of St. John of Jerusalem than we can hope to present with the aid of obscure chronicles and perishing fragments—the things which the antiquary digs up, and, when he has brought them to light in his erudite pages, has the satisfaction to be called "one of those industrious who are only re-burying the dead."

THE USE OF WATER TO VEGETATION.

The ancient Eastern philosophers, who regarded water as one of the four elements of which the world was composed, were loud in their praises regarding the wonderful effects they witnessed water produce upon the rich soils of Eastern climes. During many succeeding ages it was a common opinion that water alone was able to support vegetation; among a host of eminent names, we may select Van Helmont, Duhamel, and Boyle. These men deceived themselves, however, by not paying sufficient attention to the purity of the water in their various experiments, or not guarding against error with a sufficient degree of accuracy. Van Helmont's noted experiment upon a willow-tree was considered as convincing evidence. He filled an earthen vessel with two hundred pounds

of soil, which had been thoroughly dried in an oven, which he afterwards moistened with rain-water. In this vessel he planted a willow weighing five pounds, and placed a covering over the vessel so as to exclude dust and all other extraneous matter. Here the willow continued to grow for five years, moistened occasionally with rain or distilled water, when it was taken out and found to weigh rather more than one hundred and sixty-nine pounds, although the earth in which it had been planted, after being thoroughly dried, was found to have lost only a couple of ounces in weight. It was argued from this that an increase of one hundred and sixty-four pounds had taken place, although the only food of the willow had been water, and consequently that water only was a sufficient support to vegetation.

It was, however, afterwards ascertained that the rain water employed was so far from being chemically pure, that it contained sufficient earthy matters to supply the increased weight of the willow-tree; and it was shown that common earthen vessels will imbibe and transmit moisture abounding with such solid matters as are usually found in ordinary vegetable productions.

Still more recent discoveries have satisfactorily proved, that something more than water, when chemically pure, is necessary for the general purposes of vegetation; for wherever experiments have been tried with perfectly pure water—that is, water divested of all extraneous matters and substances—the result has been the same, the plants only vegetating for a certain time, never arriving at maturity, nor ever perfecting their seed. The florist, without possessing any knowledge of chemical science, is well aware that such bulbous roots as hyacinths, tulips, &c., which are frequently met with in glass vessels containing water, refuse to blossom unless they are planted in the earth every other year. Every attempt to make plants flourish in what are denominated the pure earths has failed where they have been watered with pure water; while an opposite result has been produced where water containing its usual impurities has been employed.

Without introducing any of the vast number of recorded experiments, from the writings of Dr. Thomson, Saussure, or others of equal authority, it is quite certain that pure water is incapable of wholly supporting the growth of trees or plants. Its uses, however, to vegetation are many and important, and it is now generally believed that water is decomposed by plants,—the oxygen becoming partially evolved, and the hydrogen becoming in some degree assimilated with carbon and oxygen into a variety of vegetable substances, most of them containing hydrogen under some form or other. That distinguished philosopher M. Berthollet was of opinion, that when exposed to the light of the sun plants possess the power of decomposing water; while Dr. Thomson, as it were in corroboration of the above opinion, remarks,—"If we consider the great quantity of hydrogen contained in plants, it is difficult to conceive how they should obtain it, provided the water they absorb does not contribute to furnish it." Sir H. Davy, in one of his lectures, remarked,—"We can only reason from facts, we cannot imitate the powers of composition belonging to vegetable structures; but, at least, we can understand them; and as far as our researches have gone, it appears that in vegetation compound forms are uniformly produced from simpler ones; and the elements in the soil, the atmosphere, and the earth, absorbed and made parts of beautiful and diversified structures."

Although, as has already been stated, pure water alone is not sufficient to support vegetation,—the most ignorant and the blindest observer of nature's handywork cannot but be aware that the health and luxuriance of vegetation greatly depend upon a regular and copious supply of water, in one shape or another; and that in all living plants water forms no inconsiderable part of their bulk or solid contents: without moisture vegetation languishes and dies. It matters but little in what form, whether it be that of rain, or dew, or the water from the neighbouring brook or river, that it is supplied to the necessities of vegetation, though all waters are not, as they are ordinarily found, impregnated with the same earths or salts, nor contain those bodies in equal quantities; but the water which contains the largest quantity of earthy soluble matter is commonly considered as the most fertilizing.

Vegetation, being generally exposed to the atmosphere, can under no circumstances be destitute of a larger or smaller supply of water, for the atmosphere is always more or less charged with aqueous vapours, and so strong is the attraction which plants have for water, that their roots and leaves are constantly absorbing it from the atmosphere or the soil that is moistened with it; and nothing more clearly exhibits the beautiful arrangement of creative wisdom than this arrangement with regard to the moisture contained in the atmosphere, for during the hottest and driest of the summer months the quantity of aqueous vapour is by far the greatest, and if such were not the case the produce of the soil would become parched and burned, and vegetation would wither and die. In proportion as the evaporation is the greatest, so is the quantity of moisture contained in the atmosphere. Upon this point Sir H. Davy makes some observations to this effect:—When the soil is dry, and the life of plants seems to be preserved by the absorbent power of their leaves, it is a beautiful circumstance in the economy of nature that aqueous vapour is most abundant in the atmosphere—when it is most needed for the purposes of life, and that when other sources of supply are cut off, this is the most copious.

The quantity of water absorbed by plants under ordinary circumstances is very considerable; and it has been ascertained that most plants transmit into the atmosphere by insensible vapour a large quantity of water daily. A cabbage, for instance, has been found to transmit half its weight daily; and a sunflower of three feet in height has been ascertained to transpire nearly two pounds of water in the same period; while a sprig of spearmint, weighing twenty-seven grains, has been found to evolve during a long period a quantity of water amounting on the average to about ninety-one grains daily!

Attempts have been unsuccessfully made to induce plants to vegetate in earth which is perfectly dry, or in air from which all the aqueous vapour has been extracted. It may be true that there are certain plants in Eastern countries, and some mosses in our own, that are known to retain the vital principal for months or years after their removal from the places where they grew; but then the atmospheric air is not excluded from them in their severed state, so that requiring but a small amount of moisture to preserve life in them, this small quantity they still continue to imbibe from the surrounding atmosphere.

As the earths generally are soluble in water, it is through this medium that the different materials which constitute the solid portion of trees, shrubs, and plants are taken up and conveyed to every part of the structure; for without a fluid medium it would be impossible for lime, silica, or clay to be conveyed from the ground upon which plants grow, to the extremities of the finest arteries that extend to the offshoots and slenderest branches.

THE COCHINEAL INSECT, AND ITS PRODUCE.

When the Spaniards first visited Mexico, they were struck with the beautiful crimson-scarlet colour of many of the articles of furniture, cloth, ornaments, &c. possessed by the natives. Eager to possess such a beautiful dye, they received orders from the Spanish Cortes to attend to its production, and to forward supplies of it to Europe. The Spaniards found that the dye was obtained from little hemispherical shrivelled grains, about an eighth of an inch in length, roundish and wrinkled on one side, and flattish on the other. For some time these little grains were supposed to be the seeds of an Indian plant; but it at length became known that each apparent grain is the female of a small insect found in Mexico and the neighbouring countries; that the insect had been killed and dried for the market; and that the colouring-matter was obtained from it by steeping or by boiling in water.

Such was the origin of our knowledge of the true nature of *Cochineal*, a name which is given to these insects when in a marketable state. The researches of Humboldt and other travellers in Mexico have enabled us to understand the mode in which the natives cultivate this valuable produce.

All the cochineal grains are the *females* only of the insect called the *coccus cacti;* the males being found deficient in the colouring-matter for which alone the insect is valuable. The insect, in a natural state, attains to maturity, performs the ordinary functions of life, deposits eggs, and then dies—all within the space of two months; and the time of gathering is just before the laying of the eggs, when the insect has swelled to a great size. After the laying, the female becomes a mere husk, and is, as well as the male, of no value in a commercial point of view. It appears, therefore, as if the unborn insects furnish the principal part of the colouring-matter, and that only a sufficient number of the females are allowed to produce their brood to continue the race.

This being the source from whence the dye is obtained, we may proceed to describe the operation of the Mexicans in its cultivation. There is a wild species of cochineal, which feeds upon most of the species of cacti found in Mexico, requires no particular attention, and is gathered six times in the year. But the cultivated cochineal is the product of slow and progressive improvement on the breed of the wild species, and is found only in the gardens and plantations of Mexico, where, provided with its choicest food, and sheltered from the inclemencies of the seasons, it attains nearly double its original size. This feeds only on one species of cactus, the *cochenilifer*, or *Nopal*, and produces only three broods in the year.

In different parts of Mexico the natives follow somewhat different plans in the cultivation of the cochineal; but in the intendency of Oaxaca the chief features are as follow:—The Indians establish their *Nopaleries* (or plantations of Nopals) on the slope of mountains, or in ravines, two or three leagues distant from their villages. After cutting and burning the trees which may have covered the ground, they plant the young Nopals (a kind of small prickly-pear tree), and tend them carefully at intervals for three years, at the end of which time the sap or juice is plentiful enough to support the insects. The proprietor of the Nopalery then purchases, about the month of April or May, some branches of the *Tuna de Castilla*, laden with young cochineals, called *semilla*, recently hatched, which feed for the time on the juice of the branches. These branches, with the insects adhering to them, are hung up in caverns, or under a shed covered with a straw roof, or in the interior of a hut, for about twenty days; after which they are exposed to the open air. The insects grow very rapidly, and by about the month of August or September they are in a fit state to be taken to the Nopalery. For this purpose they are placed in nests, made of a species of Tillandsia called *paxtle*, and are carried to the nopalery, which, as we have said, is generally two or three leagues from the villages. The insects are placed among the leaves of the Nopal, to which the females immediately attach themselves, and never afterwards seem to wish to leave the precise spot where they first fix themselves. Here the insects are carefully watched during the short time which elapses before they lay their eggs: the utmost efforts of the natives being necessary to preserve them from other insects. The women squat down by the side of the nopal-trees for hours together, cleaning the branches from intrusive visitors by means of a stag's or squirrel's tail.

When the female insect has arrived at the state most profitable for the cultivator, it has swelled to such a size in proportion to its infant state, that the legs, antennæ, and proboscis are scarcely discoverable without the aid of a microscope. They are in that state removed from the nopal leaves by means of a blunt knife, and placed in earthenware pots, where they are carefully kept for a short time. In a certain stage of their progress they are killed in one of three ways, viz. by immersion in hot water, by exposure to fire, or by exposure to fierce rays of the sun; and it is owing to these different processes that the cochineals are sometimes of a deep and at others of a bright red. In the first-named mode, the insects are put into a bag, which is immersed in scalding water; in the second, the insects are placed upon shovels, which are introduced into an oven moderately heated,—the fine quality of the cochineal depending greatly on the temperature of the oven; in the last method, they are simply placed so that the scorching heat of the sun may act uninterruptedly upon them. Thus are these poor little creatures scalded or roasted to death, in order to furnish us with carmine and scarlet dyes.

As it is necessary, in order to perpetuate the race, that the gathering should not take place too soon, it is customary to effect it when the females have deposited about half the number of their eggs, which eggs are guarded as the source of a future harvest. In a good season they reckon that one pound of young cochineals, placed in the nopal-tree, produces, in three months, twelve pounds of mother-cochineals, rich in colouring-matter, together with sufficient progeny for the next gathering.

There are, of the *cultivated* cochineal, only three harvests or gatherings in a year; and at the last of these a certain number of females are left adhering to branches of the nopal, which are then broken off, and kept carefully under cover in the huts during the rainy season. But there are some districts, particularly around the town of Oaxaca, where the cochineal cultivators, called *Nopaleros*, cause the insects to *travel* during the rainy season. In that part of the country the rain falls, in the plains and valleys, from May to October, while in the neighbouring mountains of Istepeje the rainy months are from December to April. Instead, therefore, of allowing the cochineals to remain within the huts during the rainy season of the plains, the Nopaleros remove them. They place them, covered with palm-leaves, in canastos, or baskets made of very flexible claspers, which they carry on their backs as quickly as possible to the mountains above the village of Santa Catalina, nine leagues distant from Oaxaca. The mother-cochineals produce their young by the way; and on opening the canastos they are found full of young insects, which are immediately placed in the nopal-trees of the mountains. Matters thus remain

till the month of October, when the cultivators remove the insects back to the nopaleries of Oaxaca. It is a practice analogous to that followed with the Merino sheep of Spain.

Before speaking of the purposes for which cochineal is imported into Europe, we will make a short extract from Ward's 'Mexico,' tending to show the value of the commerce in these insects:—"The plantations of the cochineal-cactus are confined to the district of La Misteca, in the state of Oaxaca. Some of these Haciendas de Nopales (nopaleries, or nopal plantations) contain from fifty to sixty thousand plants, arranged in lines, like the aloes in the Maquey plantations, which I have already described, and cut down to a certain height, in order to enable the Nopaleros to clean them more easily. In the year 1758 a government registry-office was established at Oaxaca, in consequence of the complaints of some English merchants, who had received cargoes of adulterated cochineal, in which all the cochineal produced in the province was ordered to be examined and registered. By the official returns which I possess, it appears that the value of the cochineal entered upon the books of this office up to 1815, was 91,308,907 dollars, which, upon fifty-seven years, gives an average of 1,601,910 dollars per annum, without making any allowance for contraband, which has always been carried on to the amount of nearly half a million more. The number of pounds collected during the same time was 37,835,104." Mr. Ward, taking the amount of cochineal registered, and comparing it with the quantity known to be exported, estimates the value of cochineal annually sold in Mexico at more than two millions of dollars. It is such facts as these, taken in conjunction with the small amount of capital and labour required in the production, which have induced another writer to say that "the cochineal insect, considered as an article of commerce and manufacture, is of far greater importance to mankind than any other of the insect race;" and that "the discovery of this valuable insect has contributed more efficiently to enrich the posterity of the Spanish adventurers in the new world, than the wealthy mines of Peru and Mexico."

Our dyers and colour-makers purchase cochineal of the merchants, for the purpose of producing a brilliant crimson-scarlet colouring substance. The colouring-matter may be extracted from the dried insects either by water or alcohol; the solution or decoction produced having a very rich colour, and being capable of combination with other substances in a great variety of ways. The beautiful pigment called *carmine*, used principally in miniature and water-colour painting, and sometimes as *rouge*, to give a fictitious bloom of health to a blanched cheek, is a preparation of cochineal; it is a light, soft, velvety powder, of a most rich and magnificent scarlet, inclining a little to crimson. It is produced in various ways, each manufacturer deeming his own the best; but it is understood to be the result of boiling the cochineal in pure water for a certain time, adding alum and one or two other substances, evaporating the solution, and preserving the sediment in the form of carmine. After the finest quality has been thus produced, a repetition of the process produces a second quality; and even after this there is sufficient colouring-matter to assist in the preparation of the water-colour pigment called *lake*, which is a term applied to a mixture of alum, or of some metallic oxide, with a solution of a vegetable or animal colouring-substance.

The natural colour of cochineal is crimson, and until a peculiar mode of combining it with another substance was found out, the colour at present called scarlet was hardly known. Keffler, a German chemist, is said to have discovered accidentally, about two centuries ago, that a solution of tin would exalt the crimson colour of cochineal into a scarlet. He brought his secret to London; and the first establishment for dyeing scarlet in this country appears to have been at the village of Bow, whence it obtained for a long time the name of the *Bow-dye*. About the year 1667 a Fleming named Brewe, invited over by Charles II., with the promise of a large salary, is said to have brought the art of scarlet-dyeing to great perfection.

A chemical analysis of the constitution of the cochineal, and a summary of the commercial statistics of the trade at the present day, will be found in the 'Penny Cyclopædia.

MOLES.

A CORRESPONDENT from Wix, near Harwich, has communicated to us some curious facts respecting moles, and in defence of their utility. The subject is of sufficient importance to induce us to lay the writer's ideas before the public, and the more so as the late James Hogg, the Ettrick Shepherd, was of nearly the same opinion. He had observed that in lands tenanted by the mole, the foot-rot in sheep was much less prevalent than where they had been extirpated.

"In the article on Mole-catching, in No. 608, you have considered the mole as always injurious to the occupiers of land. But from long and attentive observation, I feel satisfied that no animal is more beneficial in its calling. The farmer, I think, ignorantly and wantonly causes it to be destroyed; but were he to reflect a little and make a few observations, he would in most cases protect and not destroy those innocent and very interesting assistants to his labours. They destroy the wire-worm and all kinds of grubs deposited in the ground; and so beneficial is this, that I have seen many fields of corn greatly injured, if not ruined, by the moles not being permitted to work in them; but I never saw a field of corn injured by their working to any extent worth speaking of. If I can avoid it, I never allow them to be trapped; but the year before last, I had one field of wheat in which they were busily at work. I was anxious to preserve them, but in my absence a neighbouring mole-catcher entrapped them. Exactly at the place where I saw their little hills of earth, and for about an acre farther into the field, the wire-worm entirely destroyed my wheat. Last spring was very dry, and the wire-worm was very prevalent. I had some oats greatly injured by them, but the poor moles were destroyed in an adjoining neighbour's field; and I made it my business to examine many places in the neighbourhood where traps were set. In one field I saw eight traps set in a circle nearly, surrounding about an acre of wheat. I examined the spot, and found the worm at the roots of almost all the plants; yet the farmer was destroying the only friends that could have preserved his grain. Several other fields I examined where traps were set in the same manner, and the result was always the same. Some years since, in passing with a bailiff over a large field that had been a wood, he observed that it would grow nothing on account of the wire-worm. I said to him, 'Get some moles and turn them into it.' 'Why,' said he, 'we cannot keep them out—we destroy scores every year in it.' I said again, 'Do not destroy them.' The bailiff followed my advice, let the moles have their full play in the field, and from that time the crops have been excellent. Should you, therefore, write again in your excellent Magazine on this subject, I hope you will say a word in favour of the poor persecuted, but useful and innocent mole."